CLAIMS

1. A method of laser welding aluminum or magnesium members, said method comprising:

positioning said members together in contact between facing surfaces thereof to expose a first outer surface of at least one of said members to laser irradiation;

directing a welding laser beam at said members so as to form a molten weld pool to fuse said members together;

moving said welding laser beam relative to said members; and

heating a zone of said members so as to increase the temperature thereof and widen a heat-affected zone to slow the rate of solidification of said molten weld pool, thereby enabling formation of a substantially porosity-free weld bead joining said members.

2. A method as claimed in claim 1 wherein said heating step includes widening a temperature distribution in said members around said molten weld pool by at least 25%.

3. A method as claimed in claim 1 wherein said heating step includes positioning a heat source at a second outer surface of at least one of said members that is substantially opposite of said first outer surface.

4. A method as claimed in claim 1 wherein said heating step includes positioning a heat source at said first outer surface.

5. A method as claimed in claim 4, wherein said heating step includes said heat source being a heating laser beam that is fractionated from said welding laser beam.

6. A method of forming a linear weld between upper and lower members composed of aluminum or magnesium, said method comprising:

positioning said upper and lower members together in contact between facing surfaces thereof to expose a first outer surface of said upper member to laser irradiation;

moving a welding laser beam in a path over said first outer surface, said welding laser beam having an energy and width to progressively melt a trough of molten metal to a depth through said upper member and into said lower member, said molten metal in said trough having a void filled with gas, and said molten metal re-solidifying into re-solidified metal after the passage of said welding laser beam; and

heating in and around said trough to slow the rate of solidification of said molten metal into said re-solidified metal, thereby preventing entrainment of said gas within said re-solidified metal.

7. A method as claimed in claim 6, wherein said moving step includes the depth of said trough being greater than its width.

8. A method as claimed in claim 6 wherein said heating step includes widening a temperature distribution in said members around said molten weld trough by at least 25%.

9. A method as claimed in claim 6 wherein said heating step includes positioning a heat source at a second outer surface of at least one of said members that is substantially opposite of said first outer surface.

10. A method as claimed in claim 6 wherein said heating step includes positioning a heat source at said first outer surface.

11. A method as claimed in claim 10, wherein said heating step includes said heat source being a heating laser beam that is fractionated from said welding laser beam.

12. A method of improving the quality of a laser weld joining an assembly of members, said method comprising:

moving a welding laser beam in a path over said assembly, said welding laser beam having an energy and width to progressively melt a trough of molten metal to a depth through said upper member and into said lower member, said molten metal in said trough having a void filled with gas, and said molten metal re-solidifying into re-solidified metal after the passage of said welding laser beam; and

directing heat from a heating source toward said trough of molten metal and in accordance with said path so as to widen a heat-affected zone around said trough for slowing the rate of solidification of said molten metal into said re-solidified metal, thereby preventing entrainment of said gas within said re-solidified metal.

13. A method as claimed in claim 12, wherein the depth of said trough is greater than its width.

14. A method as claimed in claim 12 wherein said directing step includes widening a temperature distribution in said assembly around said molten weld trough by at least 25%.

15. A method as claimed in claim 12 wherein said directing step includes positioning a heat source on an opposite side of said assembly from said welding laser beam.

16. A method as claimed in claim 12 wherein said directing step includes positioning a heat source on a same side of said assembly as said welding laser beam.

17. A method as claimed in claim 16, wherein said directing step includes said heat source being a heating laser beam that is fractionated from said welding laser beam.